



NASA Space Internet Technology Project Overview

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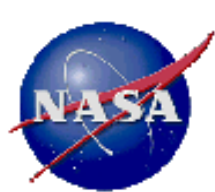
Secure Mobile Network Demonstration

Background: Justification



- Through a series of workshops and technology forums, the NASA Enterprises (and the DoD) have identified the following trends for future integrated satellite systems:
 - Need for an unprecedented level of data integration across a wide variety of platforms.
 - Satellites shift from being simply sensor platforms to being sensor platforms and communications hubs.
 - Seamless integration of terrestrial, shipboard, airborne, and space-based assets.
 - Need for secure, autonomous, shared, distributed tasking and data processing in space.
 - On-the-fly response to real-time events (predictive analysis versus post analysis).
 - Common platforms with multi-agency sensor suites requiring multi-level security and access control.
 - Desire to allow access and limited control to sophisticated systems by “unsophisticated” users.
 - Strong desire to spend less on infrastructure and more on sensor development..
 - Push for common interfaces and open standards.
 - Push for use of commercial assets / shared infrastructure to collect and disseminate data.
 - Push to improve platform flexibility to accommodate future changes in the state-of-the-art.
 - Push to reduce the need for “people in the loop”.

Key Question: Will Internet Protocols be the low cost “glue” that holds together and enables tomorrow’s “network of networks” in space, in the air, at sea, and on the ground?



Secure Mobile Network Demonstration

GRC's ACTS IP Consortium (circa 1998+)



Computing

- Sun Microsystems
- Compaq
- Microsoft
- Intel
- IBM
- Hewlett-Packard

Spacecraft Manufacturers

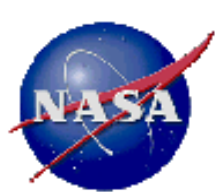
- Spectrum Astro
- Hughes Space & Communications
- Lockheed Martin
- Space Systems / Loral
- Boeing
- Ball

Communications

- Ampex Data Systems
- Comsat Laboratories
- Cisco Systems
- FORE / Marconi
- Raytheon Telecom
- Cabletron Systems

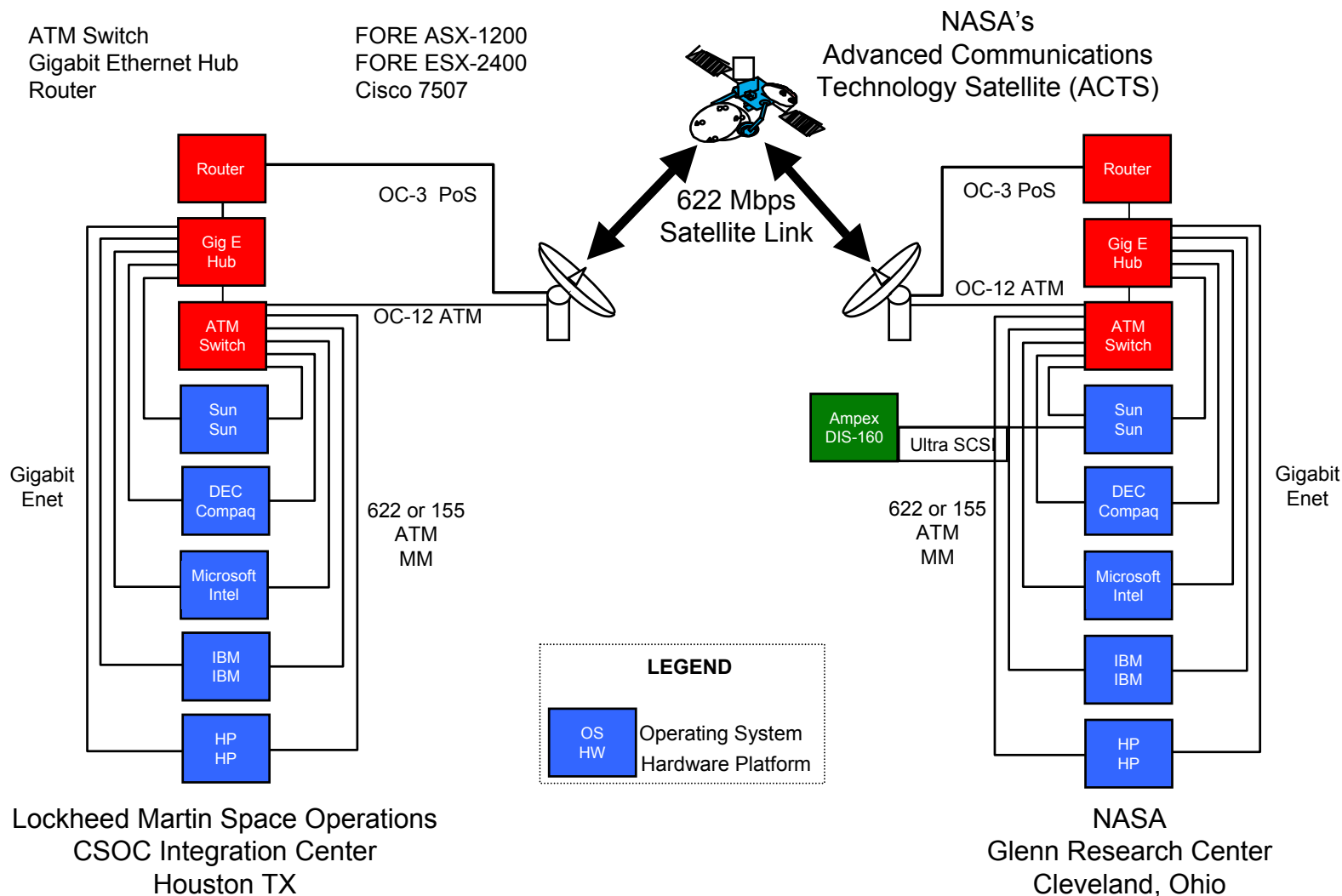
US Government Laboratories

- NASA Ames Research Center
- NASA Johnson Space Center
- NASA Goddard Space Flight Center
- NASA Jet Propulsion Laboratory
- U.S. Naval Research Laboratory
- U.S. Air Force Research Laboratory
- U.S. Army / CECOM



Secure Mobile Network Demonstration

Background: GRC's ACTS Internet Test Bed



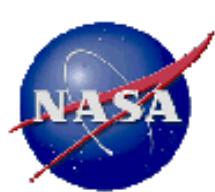


Secure Mobile Network Demonstration

Background: A New Architecture in Space?



- NASA is investing in the development of technologies to enable future Internet Protocol (IP)-based integrated space operations.
 - Goals:
 - Future spacecraft act like a “node on the Internet”.
 - Both primary satellite bus & payloads.
 - Seamless interoperability between space and ground-based systems.
 - Impact mission life cycle costs by:
 - Reducing the total time required to design, develop, test, launch, and validate spacecraft.
 - » Enables an entirely new way of performing interface verifications and integrated system checkout.
 - » Vendors predict a life cycle cost savings as high as 20-25%.
 - Reducing the cost to operate satellites and support systems.
 - Enable entirely new classes of service.
 - Telepresence.
 - Launch on demand.
 - Enable the eventual transition of space operations to commercial services.



Secure Mobile Network Demonstration

Neah Bay Demonstration Goals and Significance



- **Goals**

- Define, demonstrate, and validate a secure, mobile, Internet Protocol (IP)-compliant architecture utilizing secure Mobile Router technology under field conditions with relative motion across a variety of network domains.
 - Identify gaps and issues with Mobile IP implementation strategy.
 - Develop a strawman architecture with an eye towards incorporating similar technology aboard future NASA spacecraft.

- **Significance**

- The mobile network research conducted aboard USCG Neah Bay will have direct applicability to future spacecraft constellations or those which intend to conduct ad hoc communications with other spacecraft.
 - The demonstration will also provide insight into “real world” issues related to using commercial network services, crossing firewalls, and linking diverse domains (i.e. .mil to open networks).

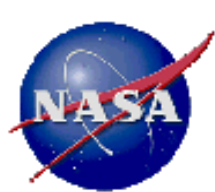


Secure Mobile Network Demonstration

Neah Bay Demonstration Participants



- Cooperative research.
 - To hold down costs and demonstrate the most realistic scenarios possible we have borrowed equipment and expertise to the greatest extent possible:
- Participants.
 - USCG (Network and Ship).
 - NASA (Networking Researching).
 - Cisco Systems (Network Development).
 - Western DataCom (Encryption Device).
 - Globalstar (Satellite Network).
 - Sea Tel Inc. (Antenna).
 - Stallion (Reverse Multiplexers).



Secure Mobile Network Demonstration

Neah Bay Experiment: Background



- Today's demonstration will concentrate on issues related to:
 - **Interoperability**
 - Is the new network fully interoperable with existing open standards (IETF, HAIPIS)?
 - **Transparency**
 - Can I field a mobile network that is truly “set and forget”?
 - **Scalability**
 - Will the technology that works on a single ship also work on many?
 - **Mobility**
 - Can I maintain network contact with something in motion without the need for manual reconfiguration?
 - **Use of Shared Infrastructure**
 - Can I take advantage of low cost (open) network infrastructure?
 - **Security**
 - Can I securely cross multiple domains (open, closed, government, military, etc...)?
 - **Bandwidth**
 - Can I accomplish all of the above and remain bandwidth efficient?



Secure Mobile Network Demonstration

Contact Information



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Publications

<http://ctd.lerc.nasa.gov/5610/repubs.html>

http://roland.grc.nasa.gov/~ivancic/papers_presentations/papers.html

<http://siw.gsfc.nasa.gov/agenda.html>